

SEQUENCE LISTING

<110> MENZEL, ROLF

<120> COMPOSITIONS AND METHODS FOR DIRECTED GENE ASSEMBLY

<130> 10424-003

<150> 60/222,134

<151> 2000-07-31

<160> 22

<170> PatentIn version 3.0

<210> 1

<211> 87

<212> DNA

<213> Artificial

<220>

<223> Description of artificial sequence: Primer

<400> 1

aattcgcggtt taaacttaat taaggtaccc attttttggc agatctagac caaaaaatgg 60
gggcggccgc tccccgggtg gcgcgcc 87

<210> 2

<211> 87

<212> DNA

<213> Artificial

<220>

<223> Description of artificial sequence: Primer

<400> 2

aattggcgcg ccacccgggg agcggccgcc cccatttttt ggtctagatc tgccaaaaaa 60
tgggtacctt aattaagttt aaacgcg 87

<210> 3

<211> 50

<212> DNA

<213> Artificial

<220>

<223> Description of artificial sequence: Primer

<400> 3

gactgcgaga tcatagatat agatttcact acgcggctgc tcaaacctgg 50

<210> 4

<211> 50

<212> DNA

<213> Artificial

<220>

<223> Description of artificial sequence: Primer

<400> 4
 ccaggtttga gcagccgcgt agtgaaatct atatctatga tctcgagtc 50

<210> 5
 <211> 87
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 5
 aatttaccat ggagcaattg catatgggtt aaacagctcg agtagatctt gcggccgctt 60
 ggctagcgtc agctgggtac catgcat 87

<210> 6
 <211> 87
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 6
 cgcgttatgc atggtaccca gctgacgcta gccaagcggc cgcaagatct actcgagctg 60
 tttaaaccat atgcaattgc tccatgg 87

<210> 7
 <211> 19
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 7
 cgcaawcygt tccttaygg 19

<210> 8
 <211> 20
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 8
 gccaggagcc atsacwtcaa 20

<210> 9
 <211> 28
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 9

ggggtaccgc ggtctattca tactttcg

28

<210> 10
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Description of artificial sequence: Primer

<400> 10
gcagatctca tttgtagaa tatgttattg agcggc

36

<210> 11
<211> 27
<212> DNA
<213> Artificial

<220>
<223> Description of artificial sequence: Primer

<400> 11
agcgatct ctattattgt gcagctg

27

<210> 12
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Description of artificial sequence: Primer

<400> 12
gcgcgtacc tgataaaagg agagggtaaa gag

33

<210> 13
<211> 1140
<212> DNA
<213> Bacillus licheniformis

<220>
<221> CDS
<222> (1)..(1140)

<400> 13
atg atg agg aaa aag agt ttt tgg ctt ggg atg ctg acg gcc tta atg
Met Met Arg Lys Lys Ser Phe Trp Leu Gly Met Leu Thr Ala Leu Met
1 5 10 15
ctc gtg ttc acg atg gcc ttc agc gat tcc gcg tct gct gct cag ccg
Leu Val Phe Thr Met Ala Phe Ser Asp Ser Ala Ser Ala Ala Gln Pro
20 25 30
gcg aaa aat gtt gaa aag gat tat att gtc gga ttt aag tgc gga gtg
Ala Lys Asn Val Glu Lys Asp Tyr Ile Val Gly Phe Lys Ser Gly Val
35 40 45
aaa acc gca tcc gtc aaa aag gac atc atc aaa gag agc ggc gga aaa
Lys Thr Ala Ser Val Lys Lys Asp Ile Ile Lys Glu Ser Gly Gly Lys
50 55 60

48

96

144

192

| | |
|---|------|
| gtg gac aag cag ttt aga atc atc aac gcg gca aaa gcg aag cta gac | 240 |
| Val Asp Lys Gln Phe Arg Ile Ile Asn Ala Ala Lys Ala Lys Leu Asp | |
| 65 70 75 80 | |
| aaa gaa gcg ctt gag gaa gtc aaa aat gat ccg gat gtc gct tat gtg | 288 |
| Lys Glu Ala Leu Glu Val Lys Asn Asp Pro Asp Val Ala Tyr Val | |
| 85 90 95 | |
| gaa gag gat cac gta gct cat gct ttg gcg caa acc gtt cct tac ggc | 336 |
| Glu Glu Asp His Val Ala His Ala Leu Ala Gln Thr Val Pro Tyr Gly | |
| 100 105 110 | |
| att cct ctc att aaa gcg gac aaa gtg cag gct caa ggc tac aag gga | 384 |
| Ile Pro Leu Ile Lys Ala Asp Lys Val Gln Ala Gln Gly Tyr Lys Gly | |
| 115 120 125 | |
| gcg aac gta aaa gtc gcc gtc ctg gat aca gga atc caa gct tct cat | 432 |
| Ala Asn Val Lys Val Ala Val Leu Asp Thr Gly Ile Gln Ala Ser His | |
| 130 135 140 | |
| ccg gac ttg aac gta gtc ggc gga gca agc ttc gta gct ggc gaa gct | 480 |
| Pro Asp Leu Asn Val Val Gly Gly Ala Ser Phe Val Ala Gly Glu Ala | |
| 145 150 155 160 | |
| tat aac acc gac ggc aac gga cac ggc acg cat gtt gcc ggt aca gta | 528 |
| Tyr Asn Thr Asp Gly Asn Gly His Gly Thr His Val Ala Gly Thr Val | |
| 165 170 175 | |
| gct gcg ctt gac aat aca acg ggt gta tta ggc gtt gcg ccg aac gta | 576 |
| Ala Ala Leu Asp Asn Thr Thr Gly Val Leu Gly Val Ala Pro Asn Val | |
| 180 185 190 | |
| tcc ttg tac gcg gtt aaa gtg ctg aat tca agc gga agc gga tct tac | 624 |
| Ser Leu Tyr Ala Val Lys Val Leu Asn Ser Ser Gly Ser Gly Ser Tyr | |
| 195 200 205 | |
| agc ggc att gta agc gga atc gag tgg gcg acg aca aac ggc atg gat | 672 |
| Ser Gly Ile Val Ser Gly Ile Glu Trp Ala Thr Thr Asn Gly Met Asp | |
| 210 215 220 | |
| gtt atc aac atg agc ctt gga gga cca tca ggc tca aca gcg atg aaa | 720 |
| Val Ile Asn Met Ser Leu Gly Gly Pro Ser Gly Ser Thr Ala Met Lys | |
| 225 230 235 240 | |
| cag gcg gtt gac aat gca tat gca aga ggg gtt gtc gtt gtg gcg gct | 768 |
| Gln Ala Val Asp Asn Ala Tyr Ala Arg Gly Val Val Val Val Ala Ala | |
| 245 250 255 | |
| gct ggg aac agc gga tct tca gga aac acg aat aca atc ggc tat cct | 816 |
| Ala Gly Asn Ser Gly Ser Ser Gly Asn Thr Asn Thr Ile Gly Tyr Pro | |
| 260 265 270 | |
| gcg aaa tac gac tct gtc atc gca gtt ggc gcg gta gac cct aac agc | 864 |
| Ala Lys Tyr Asp Ser Val Ile Ala Val Gly Ala Val Asp Pro Asn Ser | |
| 275 280 285 | |
| aac aga gct tca ttt tcc agc gtc gga gca gag ctt gaa gtc atg gct | 912 |
| Asn Arg Ala Ser Phe Ser Ser Val Gly Ala Glu Leu Glu Val Met Ala | |
| 290 295 300 | |
| cct ggc gca ggc gtg tac agc act tac cca acc agc act tat gca aca | 960 |
| Pro Gly Ala Gly Val Tyr Ser Thr Tyr Pro Thr Ser Thr Tyr Ala Thr | |
| 305 310 315 320 | |
| ttg aac gga acg tca atg gct tct cct cat gta gcg gga gca gca gct | 1008 |
| Leu Asn Gly Thr Ser Met Ala Ser Pro His Val Ala Gly Ala Ala Ala | |
| 325 330 335 | |
| ttg atc ttg tca aaa cat ccg aac ctt tca gct tca caa gtc cgc aac | 1056 |
| Leu Ile Leu Ser Lys His Pro Asn Leu Ser Ala Ser Gln Val Arg Asn | |
| 340 345 350 | |
| cgt ctc tcc agt acg gcg act tat ttg gga agc tcc ttc tac tat gga | 1104 |
| Arg Leu Ser Ser Thr Ala Thr Tyr Leu Gly Ser Ser Phe Tyr Tyr Gly | |
| 355 360 365 | |

aaa ggt ctg atc aat gtc gaa gct gcc gct caa taa
 Lys Gly Leu Ile Asn Val Glu Ala Ala Ala Gln
 370 375

1140

<210> 14
 <211> 379
 <212> PRT
 <213> Bacillus licheniformis

<400> 14
 Met Met Arg Lys Lys Ser Phe Trp Leu Gly Met Leu Thr Ala Leu Met
 1 5 10 15

Leu Val Phe Thr Met Ala Phe Ser Asp Ser Ala Ser Ala Ala Gln Pro
 20 25 30

Ala Lys Asn Val Glu Lys Asp Tyr Ile Val Gly Phe Lys Ser Gly Val
 35 40 45

Lys Thr Ala Ser Val Lys Lys Asp Ile Ile Lys Glu Ser Gly Gly Lys
 50 55 60

Val Asp Lys Gln Phe Arg Ile Ile Asn Ala Ala Lys Ala Lys Leu Asp
 65 70 75 80

Lys Glu Ala Leu Glu Glu Val Lys Asn Asp Pro Asp Val Ala Tyr Val
 85 90 95

Glu Glu Asp His Val Ala His Ala Leu Ala Gln Thr Val Pro Tyr Gly
 100 105 110

Ile Pro Leu Ile Lys Ala Asp Lys Val Gln Ala Gln Gly Tyr Lys Gly
 115 120 125

Ala Asn Val Lys Val Ala Val Leu Asp Thr Gly Ile Gln Ala Ser His
 130 135 140

Pro Asp Leu Asn Val Val Gly Gly Ala Ser Phe Val Ala Gly Glu Ala
 145 150 155 160

Tyr Asn Thr Asp Gly Asn Gly His Gly Thr His Val Ala Gly Thr Val
 165 170 175

Ala Ala Leu Asp Asn Thr Thr Gly Val Leu Gly Val Ala Pro Asn Val
 180 185 190

Ser Leu Tyr Ala Val Lys Val Leu Asn Ser Ser Gly Ser Gly Ser Tyr
 195 200 205

Ser Gly Ile Val Ser Gly Ile Glu Trp Ala Thr Thr Asn Gly Met Asp
 210 215 220

Val Ile Asn Met Ser Leu Gly Gly Pro Ser Gly Ser Thr Ala Met Lys
 225 230 235 240

Gln Ala Val Asp Asn Ala Tyr Ala Arg Gly Val Val Val Val Ala Ala
 245 250 255

Ala Gly Asn Ser Gly Ser Ser Gly Asn Thr Asn Thr Ile Gly Tyr Pro
260 265 270

Ala Lys Tyr Asp Ser Val Ile Ala Val Gly Ala Val Asp Pro Asn Ser
275 280 285

Asn Arg Ala Ser Phe Ser Ser Val Gly Ala Glu Leu Glu Val Met Ala
290 295 300

Pro Gly Ala Gly Val Tyr Ser Thr Tyr Pro Thr Ser Thr Tyr Ala Thr
305 310 315 320

Leu Asn Gly Thr Ser Met Ala Ser Pro His Val Ala Gly Ala Ala Ala
325 330 335

Leu Ile Leu Ser Lys His Pro Asn Leu Ser Ala Ser Gln Val Arg Asn
340 345 350

Arg Leu Ser Ser Thr Ala Thr Tyr Leu Gly Ser Ser Phe Tyr Tyr Gly
355 360 365

Lys Gly Leu Ile Asn Val Glu Ala Ala Ala Gln
370 375

<210> 15
<211> 1146
<212> DNA
<213> Bacillus subtilis

<220>
<221> CDS
<222> (1)..(1146)

<400> 15
gtg aga agc aaa aaa ttg tgg atc agc ttg ttg ttt gcg tta acg tta 48
Val Arg Ser Lys Lys Leu Trp Ile Ser Leu Leu Phe Ala Leu Thr Leu
1 5 10 15
atc ttt acg atg gcg ttc agc aac atg tct gcg cag gct gcc gga aaa 96
Ile Phe Thr Met Ala Phe Ser Asn Met Ser Ala Gln Ala Ala Gly Lys
20 25 30
agc agt aca gaa aag aaa tac att gtc gga ttt aaa cag aca atg agt 144
Ser Ser Thr Glu Lys Lys Tyr Ile Val Gly Phe Lys Gln Thr Met Ser
35 40 45
gcc atg agt tcc gcc aag aaa aag gat gtt att tct gaa aaa ggc gga 192
Ala Met Ser Ser Ala Lys Lys Lys Asp Val Ile Ser Glu Lys Gly Gly
50 55 60
aag gtt caa aag caa ttt aag tat gtt aac gcg gcc gca gca aca ttg 240
Lys Val Gln Lys Gln Phe Lys Tyr Val Asn Ala Ala Ala Ala Thr Leu
65 70 75 80
gat gaa aaa gct gta aaa gaa ttg aaa aaa gat ccg agc gtt gca tat 288
Asp Glu Lys Ala Val Lys Glu Leu Lys Lys Asp Pro Ser Val Ala Tyr
85 90 95
gtg gaa gaa gat cat att gca cat gaa tat gcg caa tct gtt cct tat 336
Val Glu Glu Asp His Ile Ala His Glu Tyr Ala Gln Ser Val Pro Tyr
100 105 110
ggc att tct caa att aaa gcg ccg gct ctt cac tct caa ggc tac aca 384
Gly Ile Ser Gln Ile Lys Ala Pro Ala Leu His Ser Gln Gly Tyr Thr
115 120 125

| | |
|---|------|
| ggc tct aac gta aaa gta gct gtt atc gac agc gga att gac tct tct | 432 |
| Gly Ser Asn Val Lys Val Ala Val Ile Asp Ser Gly Ile Asp Ser Ser | |
| 130 135 140 | |
| cat cct gac tta aac gtc aga ggc gga gca agc ttc gta cct tct gaa | 480 |
| His Pro Asp Leu Asn Val Arg Gly Gly Ala Ser Phe Val Pro Ser Glu | |
| 145 150 155 160 | |
| aca aac cca tac cag gac ggc agt tct cac ggt acg cat gta gcc ggt | 528 |
| Thr Asn Pro Tyr Gln Asp Gly Ser Ser His Gly Thr His Val Ala Gly | |
| 165 170 175 | |
| acg att gcc gct ctt aat aac tca atc ggt gtt ctg ggc gta gcg cca | 576 |
| Thr Ile Ala Ala Leu Asn Asn Ser Ile Gly Val Leu Gly Val Ala Pro | |
| 180 185 190 | |
| agc gca tca tta tat gca gta aaa gtg ctt gat tca aca gga agc ggc | 624 |
| Ser Ala Ser Leu Tyr Ala Val Lys Val Leu Asp Ser Thr Gly Ser Gly | |
| 195 200 205 | |
| caa tat agc tgg att att aac ggc att gag tgg gcc att tcc aac aat | 672 |
| Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu Trp Ala Ile Ser Asn Asn | |
| 210 215 220 | |
| atg gat gtt atc aac atg agc ctt ggc gga cct act ggt tct aca gcg | 720 |
| Met Asp Val Ile Asn Met Ser Leu Gly Gly Pro Thr Gly Ser Thr Ala | |
| 225 230 235 240 | |
| ctg aaa aca gtc gtt gac aaa gcc gtt tcc agc ggt atc gtc gtt gct | 768 |
| Leu Lys Thr Val Val Asp Lys Ala Val Ser Ser Gly Ile Val Val Ala | |
| 245 250 255 | |
| gcc gca gcc gga aac gaa ggt tca tcc gga agc aca agc aca gtc ggc | 816 |
| Ala Ala Ala Gly Asn Glu Gly Ser Ser Gly Ser Thr Ser Thr Val Gly | |
| 260 265 270 | |
| tac cct gca aaa tat cct tct act att gca gta ggt gcg gta aac agc | 864 |
| Tyr Pro Ala Lys Tyr Pro Ser Thr Ile Ala Val Gly Ala Val Asn Ser | |
| 275 280 285 | |
| agc aac caa aga gct tca ttc tcc agc gca ggt tct gag ctt gat gtg | 912 |
| Ser Asn Gln Arg Ala Ser Phe Ser Ser Ala Gly Ser Glu Leu Asp Val | |
| 290 295 300 | |
| atg gct cct ggc gtg tcc atc caa agc aca ctt cct gga ggc act tac | 960 |
| Met Ala Pro Gly Val Ser Ile Gln Ser Thr Leu Pro Gly Gly Thr Tyr | |
| 305 310 315 320 | |
| ggc gct tat aac gga acg tcc atg gcg act cct cac gtt gcc cga gca | 1008 |
| Gly Ala Tyr Asn Gly Thr Ser Met Ala Thr Pro His Val Ala Arg Ala | |
| 325 330 335 | |
| gca gcg tta att ctt tct aag cac ccg act tgg aca aac gcg caa gtc | 1056 |
| Ala Ala Leu Ile Leu Ser Lys His Pro Thr Trp Thr Asn Ala Gln Val | |
| 340 345 350 | |
| cgt gat cgt tta gaa agc act gca aca tat ctt gga aac tct ttc tac | 1104 |
| Arg Asp Arg Leu Glu Ser Thr Ala Thr Tyr Leu Gly Asn Ser Phe Tyr | |
| 355 360 365 | |
| tat gga aaa ggg tta atc aac gta caa gca gct gca caa taa | 1146 |
| Tyr Gly Lys Gly Leu Ile Asn Val Gln Ala Ala Ala Gln | |
| 370 375 380 | |

<210> 16
 <211> 381
 <212> PRT
 <213> Bacillus subtilis

<400> 16
 Val Arg Ser Lys Lys Leu Trp Ile Ser Leu Leu Phe Ala Leu Thr Leu
 1 5 10 15

096018-072101

Ile Phe Thr Met Ala Phe Ser Asn Met Ser Ala Gln Ala Ala Gly Lys
20 25 30

Ser Ser Thr Glu Lys Lys Tyr Ile Val Gly Phe Lys Gln Thr Met Ser
35 40 45

Ala Met Ser Ser Ala Lys Lys Lys Asp Val Ile Ser Glu Lys Gly Gly
50 55 60

Lys Val Gln Lys Gln Phe Lys Tyr Val Asn Ala Ala Ala Thr Leu
65 70 75 80

Asp Glu Lys Ala Val Lys Glu Leu Lys Lys Asp Pro Ser Val Ala Tyr
85 90 95

Val Glu Glu Asp His Ile Ala His Glu Tyr Ala Gln Ser Val Pro Tyr
100 105 110

Gly Ile Ser Gln Ile Lys Ala Pro Ala Leu His Ser Gln Gly Tyr Thr
115 120 125

Gly Ser Asn Val Lys Val Ala Val Ile Asp Ser Gly Ile Asp Ser Ser
130 135 140

His Pro Asp Leu Asn Val Arg Gly Gly Ala Ser Phe Val Pro Ser Glu
145 150 155 160

Thr Asn Pro Tyr Gln Asp Gly Ser Ser His Gly Thr His Val Ala Gly
165 170 175

Thr Ile Ala Ala Leu Asn Asn Ser Ile Gly Val Leu Gly Val Ala Pro
180 185 190

Ser Ala Ser Leu Tyr Ala Val Lys Val Leu Asp Ser Thr Gly Ser Gly
195 200 205

Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu Trp Ala Ile Ser Asn Asn
210 215 220

Met Asp Val Ile Asn Met Ser Leu Gly Gly Pro Thr Gly Ser Thr Ala
225 230 235 240

Leu Lys Thr Val Val Asp Lys Ala Val Ser Ser Gly Ile Val Val Ala
245 250 255

Ala Ala Ala Gly Asn Glu Gly Ser Ser Gly Ser Thr Ser Thr Val Gly
260 265 270

Tyr Pro Ala Lys Tyr Pro Ser Thr Ile Ala Val Gly Ala Val Asn Ser
275 280 285

Ser Asn Gln Arg Ala Ser Phe Ser Ser Ala Gly Ser Glu Leu Asp Val
290 295 300

Met Ala Pro Gly Val Ser Ile Gln Ser Thr Leu Pro Gly Gly Thr Tyr
305 310 315 320

Gly Ala Tyr Asn Gly Thr Ser Met Ala Thr Pro His Val Ala Arg Ala
 325 330 335

Ala Ala Leu Ile Leu Ser Lys His Pro Thr Trp Thr Asn Ala Gln Val
 340 345 350

Arg Asp Arg Leu Glu Ser Thr Ala Thr Tyr Leu Gly Asn Ser Phe Tyr
 355 360 365

Tyr Gly Lys Gly Leu Ile Asn Val Gln Ala Ala Ala Gln
 370 375 380

<210> 17
 <211> 32
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 17
 ggaagatcta gaggttttca ccgtcatcac cg 32

<210> 18
 <211> 34
 <212> DNA
 <213> Artificial

<220>
 <223> Description of artificial sequence: Primer

<400> 18
 ggtagatctc tttcgtcgtc ttcaagaatt ccgc 34

<210> 19
 <211> 441
 <212> DNA
 <213> Bacillus subtilis

<220>
 <221> CDS
 <222> (1)..(441)

<400> 19
 att aaa gcg gac aaa gtg cag gct caa ggc ttt aag gga gcg aat gta 48
 Ile Lys Ala Asp Lys Val Gln Ala Gln Gly Phe Lys Gly Ala Asn Val
 1 5 10 15
 aaa gta gcc gtc ctg gat aca gga atc caa gct tct cat ccg gac ttg 96
 Lys Val Ala Val Leu Asp Thr Gly Ile Gln Ala Ser His Pro Asp Leu
 20 25 30
 aac gta gtc ggc gga gca agc ttt gtg gct ggc gaa gct tat aac acc 144
 Asn Val Val Gly Gly Ala Ser Phe Val Ala Gly Glu Ala Tyr Asn Thr
 35 40 45
 gac ggc aac gga cac ggc gca cat gtt gcc ggt aca gta gct gcg ctt 192
 Asp Gly Asn Gly His Gly Ala His Val Ala Gly Thr Val Ala Ala Leu
 50 55 60

| | |
|---|-----|
| gac aat aca acg ggt gta tta ggc gtt gcg cca agc gta tcc ttg tac | 240 |
| Asp Asn Thr Thr Gly Val Leu Gly Val Ala Pro Ser Val Ser Leu Tyr | |
| 65 70 75 80 | |
| gcg gtt aaa gta ctg aat tca agc gga agc gga tca tac agc ggc att | 288 |
| Ala Val Lys Val Leu Asn Ser Ser Gly Ser Gly Ser Tyr Ser Gly Ile | |
| 85 90 95 | |
| gta agc gga atc gag tgg gcg aca aca aac ggc atg gat gtt atc aat | 336 |
| Val Ser Gly Ile Glu Trp Ala Thr Thr Asn Gly Met Asp Val Ile Asn | |
| 100 105 110 | |
| atg agc ctt ggg gga gca tca ggc tcg aca gcg atg aaa cag gca gtc | 384 |
| Met Ser Leu Gly Gly Ala Ser Gly Ser Thr Ala Met Lys Gln Ala Val | |
| 115 120 125 | |
| gac aat gca tat gca aaa ggg gtt gtc gtt gta gct gca gca ggg aac | 432 |
| Asp Asn Ala Tyr Ala Lys Gly Val Val Val Val Ala Ala Gly Asn | |
| 130 135 140 | |
| agc gga tct | 441 |
| Ser Gly Ser | |
| 145 | |

<210> 20
 <211> 147
 <212> PRT
 <213> Bacillus subtilis

<400> 20
 Ile Lys Ala Asp Lys Val Gln Ala Gln Gly Phe Lys Gly Ala Asn Val
 1 5 10 15
 Lys Val Ala Val Leu Asp Thr Gly Ile Gln Ala Ser His Pro Asp Leu
 20 25 30
 Asn Val Val Gly Gly Ala Ser Phe Val Ala Gly Glu Ala Tyr Asn Thr
 35 40 45
 Asp Gly Asn Gly His Gly Ala His Val Ala Gly Thr Val Ala Ala Leu
 50 55 60
 Asp Asn Thr Thr Gly Val Leu Gly Val Ala Pro Ser Val Ser Leu Tyr
 65 70 75 80
 Ala Val Lys Val Leu Asn Ser Ser Gly Ser Gly Ser Tyr Ser Gly Ile
 85 90 95
 Val Ser Gly Ile Glu Trp Ala Thr Thr Asn Gly Met Asp Val Ile Asn
 100 105 110
 Met Ser Leu Gly Gly Ala Ser Gly Ser Thr Ala Met Lys Gln Ala Val
 115 120 125
 Asp Asn Ala Tyr Ala Lys Gly Val Val Val Val Ala Ala Ala Gly Asn
 130 135 140
 Ser Gly Ser
 145

<210> 21
 <211> 576
 <212> DNA

<213> Bacillus subtilis

<220>

<221> CDS

<222> (1)..(576)

<400> 21

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| att | aaa | gcg | ccg | gct | ctt | cac | tct | caa | ggc | tac | aca | ggt | tct | aac | gta | 48 |
| Ile | Lys | Ala | Pro | Ala | Leu | His | Ser | Gln | Gly | Tyr | Thr | Gly | Ser | Asn | Val | |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | | |
| aaa | gta | gcc | gta | att | gac | agc | gga | att | gac | tct | tct | cat | cct | gac | ttg | 96 |
| Lys | Val | Ala | Val | Ile | Asp | Ser | Gly | Ile | Asp | Ser | Ser | His | Pro | Asp | Leu | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| aac | gtc | aga | ggc | gga | gca | agc | ttc | gta | cct | tct | gaa | aca | aac | cca | tac | 144 |
| Asn | Val | Arg | Gly | Gly | Ala | Ser | Phe | Val | Pro | Ser | Glu | Thr | Asn | Pro | Tyr | |
| | | | 35 | | | | 40 | | | | | 45 | | | | |
| caa | gat | ggc | agt | tct | cac | ggc | aca | cat | gta | gcc | ggt | acg | gtt | gcc | gca | 192 |
| Gln | Asp | Gly | Ser | Ser | His | Gly | Thr | His | Val | Ala | Gly | Thr | Val | Ala | Ala | |
| | | | 50 | | | 55 | | | | | 60 | | | | | |
| ctt | aat | aac | tca | atc | ggg | gtt | ttg | ggc | gta | gcg | cca | aac | gca | tcg | tta | 240 |
| Leu | Asn | Asn | Ser | Ile | Gly | Val | Leu | Gly | Val | Ala | Pro | Asn | Ala | Ser | Leu | |
| 65 | | | | 70 | | | | 75 | | | | | 80 | | | |
| tat | gca | gta | aaa | gtt | ctt | gat | tca | aca | gga | aac | ggc | caa | tac | agc | tgg | 288 |
| Tyr | Ala | Val | Lys | Val | Leu | Asp | Ser | Thr | Gly | Asn | Gly | Gln | Tyr | Ser | Trp | |
| | | | 85 | | | | | 90 | | | | | 95 | | | |
| att | att | aac | ggc | att | gag | tgg | gcc | att | tcc | aac | aaa | atg | gac | gtg | att | 336 |
| Ile | Ile | Asn | Gly | Ile | Glu | Trp | Ala | Ile | Ser | Asn | Lys | Met | Asp | Val | Ile | |
| | | | 100 | | | | 105 | | | | | | 110 | | | |
| aac | atg | agc | ctt | ggc | gga | cct | tct | ggt | tct | aca | gct | ttg | aaa | tca | gtc | 384 |
| Asn | Met | Ser | Leu | Gly | Gly | Pro | Ser | Gly | Ser | Thr | Ala | Leu | Lys | Ser | Val | |
| | | | 115 | | | 120 | | | | | | 125 | | | | |
| gtt | gat | aga | gcc | gta | gcc | agc | ggg | atc | gtc | gtt | gtt | gct | gca | gcc | gga | 432 |
| Val | Asp | Arg | Ala | Val | Ala | Ser | Gly | Ile | Val | Val | Ala | Ala | Ala | Ala | Gly | |
| | | | 130 | | | 135 | | | | | 140 | | | | | |
| aat | gaa | ggc | act | tcc | gga | agc | tca | agc | aca | atc | ggc | tat | cct | gca | aaa | 480 |
| Asn | Glu | Gly | Thr | Ser | Gly | Ser | Ser | Ser | Thr | Ile | Gly | Tyr | Pro | Ala | Lys | |
| 145 | | | | 150 | | | | | | 155 | | | | 160 | | |
| tat | cct | tct | acc | att | gcg | gta | ggg | gcg | gta | aac | agc | agc | aac | caa | aga | 528 |
| Tyr | Pro | Ser | Thr | Ile | Ala | Val | Gly | Ala | Val | Asn | Ser | Ser | Asn | Gln | Arg | |
| | | | 165 | | | | | 170 | | | | | 175 | | | |
| ggg | tca | ttc | tca | agc | gta | ggg | cct | gag | ctt | gaa | gtc | atg | gct | cct | ggc | 576 |
| Gly | Ser | Phe | Ser | Ser | Val | Gly | Pro | Glu | Leu | Glu | Val | Met | Ala | Pro | Gly | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |

<210> 22

<211> 192

<212> PRT

<213> Bacillus subtilis

<400> 22

| | | | | | | | | | | | | | | | |
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| Ile | Lys | Ala | Pro | Ala | Leu | His | Ser | Gln | Gly | Tyr | Thr | Gly | Ser | Asn | Val |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | |
| Lys | Val | Ala | Val | Ile | Asp | Ser | Gly | Ile | Asp | Ser | Ser | His | Pro | Asp | Leu |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Asn | Val | Arg | Gly | Gly | Ala | Ser | Phe | Val | Pro | Ser | Glu | Thr | Asn | Pro | Tyr |
| | | | 35 | | | | 40 | | | | | 45 | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gln | Asp | Gly | Ser | Ser | His | Gly | Thr | His | Val | Ala | Gly | Thr | Val | Ala | Ala | |
| 50 | | | | | | 55 | | | | | 60 | | | | | |
| Leu | Asn | Asn | Ser | Ile | Gly | Val | Leu | Gly | Val | Ala | Pro | Asn | Ala | Ser | Leu | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | |
| Tyr | Ala | Val | Lys | Val | Leu | Asp | Ser | Thr | Gly | Asn | Gly | Gln | Tyr | Ser | Trp | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| Ile | Ile | Asn | Gly | Ile | Glu | Trp | Ala | Ile | Ser | Asn | Lys | Met | Asp | Val | Ile | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| Asn | Met | Ser | Leu | Gly | Gly | Pro | Ser | Gly | Ser | Thr | Ala | Leu | Lys | Ser | Val | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| Val | Asp | Arg | Ala | Val | Ala | Ser | Gly | Ile | Val | Val | Val | Ala | Ala | Ala | Gly | |
| | 130 | | | | | 135 | | | | | | 140 | | | | |
| Asn | Glu | Gly | Thr | Ser | Gly | Ser | Ser | Ser | Thr | Ile | Gly | Tyr | Pro | Ala | Lys | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| Tyr | Pro | Ser | Thr | Ile | Ala | Val | Gly | Ala | Val | Asn | Ser | Ser | Asn | Gln | Arg | |
| | | | | 165 | | | | | 170 | | | | | 175 | | |
| Gly | Ser | Phe | Ser | Ser | Val | Gly | Pro | Glu | Leu | Glu | Val | Met | Ala | Pro | Gly | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |

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